



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Lakin et al.

Serial No.: 10/658,638

Filed: September 9, 2003

Title: Whole-Body Mathematical Model for  
Simulating Intracranial Pressure  
Dynamics

Attorney Docket No.: B02962-00062

Group Art Unit: 3713

Examiner: Not yet assigned

USPTO Customer No.: 21918

CERTIFICATE OF MAILING (37 C.F.R. 1.8a)

I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

*Anthony P. Gangemi*  
Anthony P. Gangemi

*1/20/2004*  
Date

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

January 20, 2004

**Transmittal of Information Disclosure Statement  
Under 37 C.F.R. §1.97(b)**

In connection with the above-identified application, please find attached an Information Disclosure Statement and copies of all references cited therein.

The Information Disclosure Statement transmitted herewith is being filed before the mailing date of a first Office Action on the merits. Therefore, no fee is due in connection with this submission.

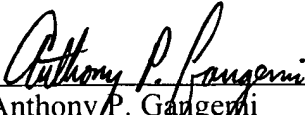
P242-12/00

Law Offices of  
**Downs Rachlin Martin PLLC**  
199 Main Street  
P.O. Box 190  
Burlington, VT 05402-0190  
(802) 863-2375

If any other fee is due with respect to the present application, please charge, or credit any overcharge, to Deposit Account No. 04-1588.

Respectfully submitted,

DOWNS RACHLIN MARTIN PLLC

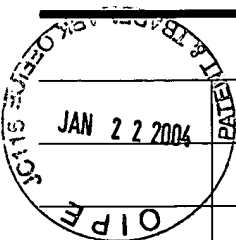
By:   
Anthony P. Gargeri  
Attorney of Record  
Registration No.: 42,565  
Tel: (802) 863-2375

BTV.257979.1

P242-12/00

Law Offices of  
**Downs Rachlin Martin PLLC**  
199 Main Street  
P.O. Box 190  
Burlington, VT 05402-0190  
(802) 863-2375

|                                                                                         |                                   |                          |
|-----------------------------------------------------------------------------------------|-----------------------------------|--------------------------|
| FORM PTO-1449 (Modified)                                                                | ATTY DOCKET NO.<br>02962-00062    | SERIAL NO.<br>10/658,638 |
| LIST OF PATENTS AND PUBLICATIONS FOR<br>APPLICANT'S INFORMATION DISCLOSURE<br>STATEMENT | APPLICANT:<br>Lakin et al.        |                          |
| Page 1 of 2<br>(Use several sheets if necessary.)                                       | FILING DATE:<br>September 9, 2003 | GROUP:<br>3713           |



**OTHER ART (Including Author, Title, Date, Pertinent Pages, etc.)**

|    |                                                                                                                                                                                                                                                                                                                      |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA | Agarwal GC, Berman BM, and Stark LA: A lumped parameter model of the cerebrospinal fluid system. IEEE Trans Biomed Eng 45:53, Jan. 1969                                                                                                                                                                              |
| AB | Albeck MJ, Gjerris F, Sorenson PS, et al: Intracranial pressure and cerebrospinal fluid outflow conductance in healthy subjects. J. Neurosurgery 74:597-600, 1991                                                                                                                                                    |
| AC | Chemia D, Herbert JL, Coirault C, Zamani K, Suard I, Colin P, and LeCarpentier Y: Total arterial compliance estimated by stroke volume-to-aortic pulse pressure ratio in humans. Am J Physiol 274 (Heart Circ Physiol 43): 500-505, 1998                                                                             |
| AD | Chopp M and Portnoy HD: Systems analysis of intracranial pressure. J Neurosurgery 53:516-527, 1980                                                                                                                                                                                                                   |
| AE | Czosnyka M, Piechnik S, Koszewski W, Laniewski P, Maksymowicz W, Paluszek K, Smielewski P, Zabolotny W, and Zaworski W: The dynamics of cerebral blood perfusion pressure and CSF circulation – a modelling study. In Avezaat et al. (eds.), Intracranial Pressures VIII. Berlin-Heidelberg, Springer, 699-706, 1993 |
| AF | Czosnyka M, Piechnik S, Richards S, Kirkpatrick P, Smielewski P, and Pickard JD: Contribution of mathematical modelling to the interpretation of bedside tests of cerebrovascular autoregulation. J Neurol Neurosurg Psychiatry 63:721-731, 1997                                                                     |
| AG | Friden H and Ekstedt J: Volume/Pressure relationships of the cerebrospinal space in humans. Neurosurgery 4:351-366, 1983                                                                                                                                                                                             |
| AH | Hakim S, Venegas JG, and Burton JD: The physics of the cranial cavity, hydrocephalus and normal pressure: Mechanical interpretation and mathematical models. Surg Neurol 5:187-210, 1976                                                                                                                             |
| AI | Hoffmann O: Biomathematics of intracranial CSF and haemodynamics. Simulation and analysis with the aid of a mathematical model. Acta Neurochir Suppl 40:117-130, 1987                                                                                                                                                |
| AJ | Kadas ZM, Lakin WD, Yu J, and Penar PL: A mathematical model of the intracranial system including autoregulation. Neurological Research 19:441-450, 1997                                                                                                                                                             |
| AK | Karni Z, Bear J, Sorek S, and Pinczewski Z: A quasi-steady state compartmental model of intracranial fluid dynamics. Med Biol Engng Comput 25:167-172, 1987                                                                                                                                                          |
| AL | Karni Z, Ivan LP, and Bear J: An outline of continuum modelling of brain tissue mechanics. J Child Neuro 1:119-125, 1986                                                                                                                                                                                             |
| AM | Lakin WD and Gross CE: A nonlinear haemodynamic model for the arterial pulsatile component of the intracranial pulse wave. Neurol Res 14:219-225, 1992                                                                                                                                                               |
| AN | Lakin WD, Yu J, and Penar P: Mathematical modeling of pressure dynamics in the intracranial system. Nova Journal of Mathematics, Game Theory and Algebra 5-2, 1996                                                                                                                                                   |
| AO | Lakin WD, Yu J, and Penar P: Analysis and validation of a mathematical model for intracranial pressure dynamics. Mathematical and Computer Modelling of Dynamical Systems 3:54-73, 1999                                                                                                                              |
| AP | Lewer AK and Bunt EA: Dysfunction of the fluid mechanical cerebrospinal systems as revealed by stress/strain diagrams. S Afr Mech Eng 28:159-166, 1978                                                                                                                                                               |
| AQ | Miller JD: Volume and pressure in the craniospinal axis. Clin Neurosurg 22:76-105, 1975                                                                                                                                                                                                                              |
| AR | Murgo JP, Westerhof N, Giolma JP, and Altobelli SA: Aortic input impedance in normal man: relationship to pressure wave forms. Circulation 62:105-115, 1980                                                                                                                                                          |
| AS | Nylin G, Hedlund S, and Regnstrom O: Studies of the cerebral circulation with labeled erythrocytes in healthy man. Circ Res 9:664-674, 1961                                                                                                                                                                          |

EXAMINER

DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

|                                                                                                                                                                                      |                                   |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------|
| FORM PTO-1449 (Modified)<br><br>LIST OF PATENTS AND PUBLICATIONS FOR<br>APPLICANT'S INFORMATION DISCLOSURE<br>STATEMENT<br><br>Page 2 of 2<br><br>(Use several sheets if necessary.) | ATTY DOCKET NO.<br>02962-00062    | SERIAL NO.<br>10/658,638 |
|                                                                                                                                                                                      | APPLICANT:<br>Lakin et al.        |                          |
|                                                                                                                                                                                      | FILING DATE:<br>September 9, 2003 | GROUP:<br>3713           |

**OTHER ART (Including Author, Title, Date, Pertinent Pages, etc.)**

|    |                                                                                                                                                                                                                                           |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BA | Parazynski SE, Hargens AR, Tucker B, Aratow M, Styf J, and Crenshaw A: Transcapillary fluid shifts in the tissues of the head and neck during and after simulated microgravity. J. Appl. Physiol. 71(6): 2469-2475, 1991                  |
| BB | Rekate HL, Brodkey JA, El-Sakka W, and Ko WH: Ventricular volume regulation: a mathematical model and computer simulation. Pediat Neurosci 14:77-84, 1988                                                                                 |
| BC | Renkin EM, Watson PD, Sloop CH, Joyner WM, and Curry FE: Transport pathways for fluid and large molecules in microvascular endothelium of the dog's paw. Microvasc. Res. 14:205-214, 1977                                                 |
| BD | Sorek S, Bear J, and Karni Z: A non-steady compartmental flow model of the cerebrovascular system. J Biomechanics 21:695-704, 1988                                                                                                        |
| BE | Stevens SA: Mean Pressures and Flows of the Human Intracranial System as Determined by Mathematical Simulations of a Steady-State Infusion Test. Neurological Research, 22:809-814, 2000                                                  |
| BF | Stevens SA, Lakin WD, and Goetz W: A differentiable, periodic function for pulsatile cardiac output based on heart rate and stroke volume. Mathematical Biosciences, 2003 (to appear)                                                     |
| BG | Stevens SA, and Lakin WD: Local Compliance Effects on the Global CSF Pressure-Volume Relationship in Models of Intracranial Pressure Dynamics. Mathematical and Computer Modelling of Dynamical Systems, Volume 6, Number 4:445-465, 2001 |
| BH | Sullivan H, and Allison J: Physiology of cerebrospinal fluid. In: Wilkins R, and Rengachary S, eds. New York: McGraw Hill Book Co. Neurosurgery 3:2125-2135, 1985                                                                         |
| BI | Taylor AE, Granger DN, and Brace RA: Analysis of lymphatic protein flux data. I. Estimation of the reflection coefficient and permeability surface area product for total protein. Microvasc. Res. 13:297-313, 1977                       |
| BJ | Watenpugh DE, Breit GA, Ballard RE, Zietz S, and Hargens AR: Vascular compliance in the leg is lower than that in the neck of humans. Medicine and Science in Sports and Exercise (Suppl. 5):S26(137), 1993                               |

**REFERENCE DESIGNATION**

**U.S. PATENT DOCUMENTS**

| EXAMINERS INITIALS | DOCUMENT NUMBER | DATE       | NAME               | CLASS | SUBCLASS | FILING DATE (IF APPRO.) |
|--------------------|-----------------|------------|--------------------|-------|----------|-------------------------|
| BK                 | 5,947,899       | 9/7/1999   | Winslow et al.     | 600   | 410      |                         |
| BL                 | 5,839,438       | 11/24/1998 | Graettinger et al. | 128   | 630      |                         |
| BM                 |                 |            |                    |       |          |                         |
| BN                 |                 |            |                    |       |          |                         |
| BO                 |                 |            |                    |       |          |                         |
| BP                 |                 |            |                    |       |          |                         |

|          |                 |
|----------|-----------------|
| EXAMINER | DATE CONSIDERED |
|----------|-----------------|

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

P270 - 02/03  
BTv.257971.1